

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

10/031163INTERNATIONAL APPLICATION NO.
PCT/DE00/01989INTERNATIONAL FILING DATE
15th June 2000
(15.06.00)PRIORITY DATE CLAIMED:
17 July 1999
(17.07.99)

TITLE OF INVENTION

LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR FOR AUTOMATIC SWITCHING OF LIGHTING DEVICES

APPLICANT(S) FOR DO/EO/US

Norbert HOG, Bruno HODAPP, Rainer PIENKA, Hans MEIER, Henry BLITZKE and Manfred BURKART

Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) **UNSIGNED**.
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☒ A substitute specification and marked-up version of substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: International Search Report, Preliminary Examination Report and PCT/RO/101.

10/031163

16 JAN 2002

17. ☒ The following fees are submitted:**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO \$890.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) \$710.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482) but
international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$740.00Neither international preliminary examination fee (37 CFR 1.482) nor international
search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1,040.00International preliminary examination fee paid to USPTO (37 CFR 1.482) and all
claims satisfied provisions of PCT Article 33(2)-(4) \$100.00

CALCULATIONS | PTO USE ONLY

ENTER APPROPRIATE BASIC FEE AMOUNT =

\$ 890

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months
from the earliest claimed priority date (37 CFR 1.492(e)).

\$

Claims	Number Filed	Number Extra	Rate		
Total Claims	12 - 20 =	0	X \$18.00	\$0	
Independent Claims	1 - 3 =	0	X \$84.00	\$0	
Multiple dependent claim(s) (if applicable)			+ \$280.00	\$	

TOTAL OF ABOVE CALCULATIONS =

\$890

Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must
also be filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$

SUBTOTAL =

\$890

Processing fee of \$130.00 for furnishing the English translation later the ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).

+

\$

TOTAL NATIONAL FEE =

\$890

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

+

\$

TOTAL FEES ENCLOSED =

\$890

Amount to be:
refunded \$
charged \$

- a. ☐ A check in the amount of \$_____ to cover the above fees is enclosed.
- b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of \$890.00 to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.SEND ALL CORRESPONDENCE TO:
Kenyon & Kenyon
One Broadway
New York, New York 10004

SIGNATURE

Richard L. Mayer, Reg. No. 22,490
NAME

DATE



26646

PATENT TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

10/031163

INTERNATIONAL APPLICATION NO.
PCT/DE00/01989INTERNATIONAL FILING DATE
15th June 2000
(15.06.00)PRIORITY DATE CLAIMED:
17 July 1999
(17.07.99)

TITLE OF INVENTION

LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR FOR AUTOMATIC SWITCHING OF LIGHTING DEVICES

APPLICANT(S) FOR DO/EO/US

Norbert HOG, Bruno HODAPP, Rainer PIENKA, Hans MEIER, Henry BLITZKE and Manfred BURKART

Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) **UNSIGNED**.
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☒ A substitute specification and marked-up version of substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: International Search Report, Preliminary Examination Report and PCT/RO/101.

[10191/2202]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s) : Norbert HOG et al.
Serial No. : To Be Assigned
Filed : Herewith
For : LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR
FOR AUTOMATIC SWITCHING OF LIGHTING
DEVICES

Art Unit : To Be Assigned
Examiner : To Be Assigned

Assistant Commissioner for Patents
Washington, D.C. 20231

**PRELIMINARY AMENDMENT AND
37 C.F.R. § 1.125 SUBSTITUTE SPECIFICATION STATEMENT**

SIR:

Please amend the above-identified application before examination, as set forth below.

IN THE SPECIFICATION AND ABSTRACT:

In accordance with 37 C.F.R. § 1.121(b)(3), a Substitute Specification (including the Abstract, but without claims) accompanies this response. It is respectfully requested that the Substitute Specification (including Abstract) be entered to replace the Specification of record.

IN THE CLAIMS:

Please cancel claims 1-11, without prejudice.

Please add the following new claims:

12. (New) A light-sensitive sensor unit comprising:

at least two light-sensitive sensors including light guide elements having a predetermined reception characteristic, the at least two sensors including at least one first sensor detecting global lighting conditions and at least one second sensor detecting lighting

EL 244510440

conditions in predetermined directions, the light guide elements being joined in one piece to form a light guide body.

13. (New) The sensor unit according to claim 12, wherein the sensor unit is for automatic switching of lighting devices in a motor vehicle.

14. (New) The sensor unit according to claim 12, wherein the at least two sensors include at least three sensors detecting light from predetermined directions.

15. (New) The sensor unit according to claim 13, wherein at least one of the sensors is aligned with a predetermined direction in a direction of travel of the vehicle.

16. (New) The sensor unit according to claim 13, wherein at least one of the sensors detects lighting conditions in a predetermined direction and forms an angle with a straight line in a direction of travel of the vehicle.

17. (New) The sensor unit according to claim 13, wherein the at least two sensors include two sensors on each side each enclosing an angle with a straight line pointing in a direction of travel and having a common light-sensitive sensor element.

18. (New) The sensor unit according to claim 12, wherein the light guide elements are joined such that there is a smooth transition between the light guide elements.

19. (New) The sensor unit according to claim 12, wherein the light guide elements include light detection cones that overlap.

20. (New) The sensor unit according to claim 12, wherein the sensor elements distinguish between daylight and artificial light.

21. (New) The sensor unit according to claim 12, further comprising an analyzer unit for distinguishing between daylight and artificial light.

22. (New) The sensor unit according to claim 12, wherein the light guide body is integrated into a light guide body of a rain sensor device.

23. (New) The sensor unit according to claim 22, wherein the light guide body is made in a multicomponent injection molding process, together with the light guide body of the rain sensor device and a coupling medium.

Remarks

This Preliminary Amendment cancels without prejudice claims 1-11, in the underlying PCT Application No. PCT/DE00/01989, and adds new claims 12-23. The new claims conform the claims to U.S. Patent and Trademark Office rules and do not add new matter to the application.

In accordance with 37 C.F.R. § 1.121(b)(3), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. § 1.121(b)(3)(iii) and § 1.125(b)(2), a Marked Up Version Of The Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) is respectfully requested.

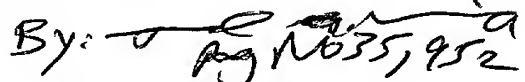
The underlying PCT Application No. PCT/DE00/01989 includes an International Search Report, dated November 6, 2000. The Search Report includes a list of documents that were uncovered in the underlying PCT Application. A copy of the Search Report accompanies this Preliminary Amendment.

The underlying PCT Application No. PCT/DE00/01989 also includes an International Preliminary Examination Report, dated April 24, 2001, a copy of which is included, including a translation.


Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,

KENYON & KENYON

By:  Ag No 35,952

Dated: 1/16/02

By: 
Richard L. Mayer
(Reg. No. 22,490)

One Broadway
New York, NY 10004
(212) 425-7200

[10191/2202]

LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR FOR AUTOMATIC SWITCHING OF LIGHTING DEVICES

Field Of The Invention

The present invention relates to a light-sensitive sensor unit, in particular for automatic switching of lighting devices in vehicles.

Background Information

Such a sensor unit is known from German Patent No. 195 23 262.3, which includes a global sensor and a directional sensor for detecting the lighting conditions outside the vehicle. The sensor unit is connected to the analyzer unit which determines from the signals of the sensor unit whether a change in the circuit state of the lighting device is necessary under the given lighting conditions prevailing in the surroundings of the vehicle. Although this known sensor unit permits automatic switching of the lighting device, it includes a relatively large number of parts due to the global sensors and the directional sensors, and this means a high cost and expensive adjustment.

Summary Of The Invention

The device according to the present invention has the advantage that a simple, compact, robust, easy-to-assemble and practically adjustment-free sensor unit is available due to the integration of the global and directional sensors. Furthermore, the device includes only a minimal number of components, which permits simple and inexpensive production with expanded functionality. The small dimensions which are possible due to the integration of the global and directional sensors have proven to be another major advantage, because the size of components on the windshields of motor vehicles which interfere with vision should be minimized.

Due to the fact that at least three sensors detect light from predetermined directions,

SUBSTITUTE SPECIFICATION

8L244510440

a wider range in front of the vehicle is detected. If at least one sensor is arranged in the direction of travel and the two other sensors are arranged, pivoted out of the direction of travel by an angle α on both sides, this yields a wide cone of detection in front of the vehicle, so that even the entrance of a tunnel which is not yet in the direction of travel can be detected and the lighting devices controlled accordingly.

If the directional sensors have lens-like elements, which may also have a smooth transition between them, the detection cone may be adjusted individually to the wishes of the automobile manufacturer.

Integration of the light guide body of the sensor unit into a light guide body of a rain sensor device makes it possible to eliminate additional components and to further reduce the number of components on the windshield which interfere with vision, in particular when the light guide body is manufactured in a multicomponent injection molding process together with the light guide body of the rain sensor and the coupling medium.

Brief Description Of The Drawings

Fig. 1 shows a section through a sensor unit according to the present invention.

Fig. 2 shows a diagram of the sensor unit integrated into a light guide body of a rain sensor in a perspective view.

Detailed Description

Fig. 1 shows a sensor unit 10 according to the present invention, mounted on a windshield 11, in particular a windshield of a motor vehicle. Sensor unit 10 is composed of multiple sensors 12, each sensor 12 including a sensor element 13 and a light guide element 14, 14a. However, two light guide elements 14 here together use one sensor element 13, so that there are three light-sensitive sensor elements 13 having four light guide elements 14 and 14a. The light guide body on

SUBSTITUTE SPECIFICATION

which light guide elements 14, 14a are mounted is composed of an at least partially transparent plate having cylindrical recesses sealed with lens-shaped round bodies. These cylindrical recesses together with the lens-shaped round bodies form a light guide element 14, 14a. If parallel light passes through the lens-shaped round bodies along the center axis of the cylindrical recesses, it yields a focal point f which characterizes a focal distance of light guide element 14, 14a.

Sensor elements 13 are each arranged between focal points f of light guide elements 14 and light guide elements 14 themselves. This yields a light detection cone directed forward in the direction of travel, allowing detection in predetermined directions. The cone angle of the light detection cone can be adjusted through the distance between focal points f of respective light guide element 14 and light-sensitive sensor elements 13.

An analyzer unit 15 controls the switching of a lighting device 16 as a function of the signals of sensor elements 13. Sensor elements 13 may be mounted jointly to a circuit board 17 and are preferably designed to permit a differentiation between daylight and artificial light to prevent a shutdown due to artificial lighting in a tunnel, for example. This can be accomplished through a suitable choice of the sensitivity range of sensor elements 13. It is also possible to select the sensitivity range so that certain spectral ranges or characteristic lines, e.g., of gas discharge lamps, are detected, thus permitting control of the high and low beams in a motor vehicle.

In addition to these directional sensors, at least one light guide element 14a is aimed forward but not necessarily in the direction of travel. The light detection cone of this minimum of one light guide element 14a has a very large cone angle and detects global lighting conditions outside the vehicle.

All light guide elements 14, 14a, in particular the sensors of the global sensors and directional sensors, are combined in one piece in a light guide body 18. This light

SUBSTITUTE SPECIFICATION

guide body 18 may be manufactured as an injection molded part of transparent or UV-permeable plastic. It is likewise possible to manufacture light guide body 18 of a pigmented or coated plastic which includes an optionally desired filter effect for influencing the sensitivity range of the sensor. This light guide body is pressed onto the windshield over a coupling medium 19, e.g., a silicone pad. Coupling medium 19 prevents air inclusions between windshield 11 and light guide body which would cause unwanted scattering. It is also possible to apply coupling medium 19 directly to light guide body 18 in the manufacture thereof in a multicomponent injection molding process.

SUBSTITUTE SPECIFICATION

Abstract Of The Disclosure

5 A light-sensitive sensor unit, in particular for automatic switching of lighting devices, preferably in motor vehicles, including at least two light-sensitive sensors, at least one first sensor detecting the global lighting conditions, and at least one second sensor detecting the lighting conditions in predetermined directions. All light guide elements provided for the sensors are joined in one piece to form a light guide body.

439670

SUBSTITUTE SPECIFICATION

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro



(43) Internationales Veröffentlichungsdatum
25. Januar 2001 (25.01.2001)

PCT

(10) Internationale Veröffentlichungsnummer
WO 01/05625 A1

(51) Internationale Patentklassifikation⁷: B60Q 1/14

(71) Anmelder (für alle Bestimmungsstaaten mit Ausnahme von
US): ROBERT BOSCH GMBH [DE/DE]; Postfach 30 02
20, D-70442 Stuttgart (DE).

(21) Internationales Aktenzeichen: PCT/DE00/01989

(22) Internationales Anmeldedatum:
15. Juni 2000 (15.06.2000)

(72) Erfinder; und
(75) Erfinder/Anmelder (nur für US): HOG, Norbert
[DE/DE]; Im Wasserbett 12, D-77815 Buehl (DE).
HODAPP, Bruno [DE/DE]; Katzenfeld 7, D-77855
Achern-Oensbach (DE). PIENKA, Rainer [DE/DE];
Krokusweg 12, D-77871 Renchen (DE). MEIER, Hans
[DE/DE]; Mooslandstrasse 49, D-77833 Ottersweier
(DE). BLITZKE, Henry [DE/DE]; Forlenstrasse 3,
D-77815 Buehl (DE). BURKART, Manfred [DE/DE];
Benazetstrasse 6, D-76473 Iffezheim (DE).

(25) Einreichungssprache: Deutsch

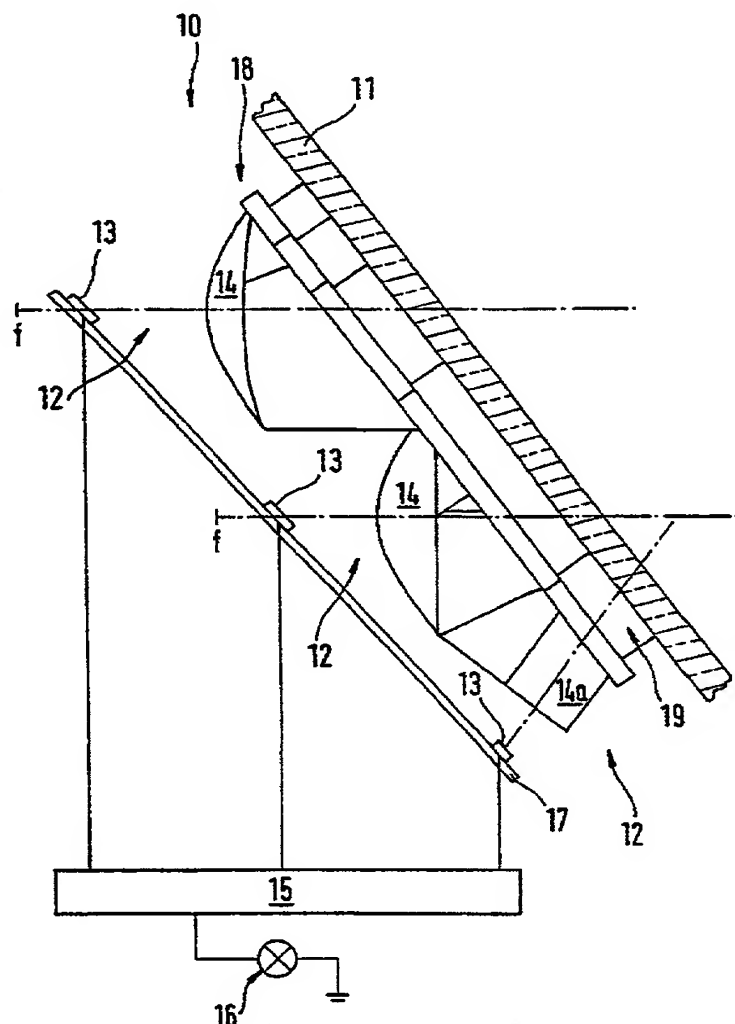
(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
199 33 642.3 17. Juli 1999 (17.07.1999) DE

[Fortsetzung auf der nächsten Seite]

(54) Title: PHOTSENSITIVE DETECTION UNIT, IN PARTICULAR FOR AUTOMATIC CONNECTION OF LIGHTING
EQUIPMENT

(54) Bezeichnung: LICHTEMPFLINDLICHE SENSOREINHEIT, INSBESONDERE ZUM AUTOMATISCHEN SCHALTEN
VON BELEUCHTUNGSEINRICHTUNGEN



(57) Abstract: The invention concerns a photosensitive detection unit (10), in particular for automatically connecting lighting equipment, preferably of vehicles, comprising at least two photosensitive detectors (12), whereof at least a first detector (13) detects global lighting conditions, and at least the second detector detects lighting conditions in predetermined directions. All the light conducting elements (14, 14a) associated with the detectors (13) are assembled in one single component to a light conducting body.

(57) Zusammenfassung: Lichtempfindliche Sensoreinheit (10), insbesondere zum automatischen Schalten von Beleuchtungseinrichtungen, vorzugsweise von Kraftfahrzeugen, welche mindestens zwei lichtempfindliche Sensoren (12) umfaßt, wobei mindestens ein erster Sensor (13) die globalen Lichtverhältnisse, und mindestens ein zweiter Sensor die Lichtverhältnisse in vorbestimmten Richtungen detektiert. Dabei sollen alle den Sensoren (13) zugeordneten Lichtleitelemente (14, 14a) zu einem Lichtleitkörper einstückig verbunden sein.

WO 01/05625 A1

2/pt

[10191/2202]

LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR FOR AUTOMATIC
SWITCHING OF LIGHTING DEVICES

Background Information

5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425
430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535
540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640
645
650
655
660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965
970
975
980
985
990
995

The present invention relates to a light-sensitive sensor unit, in particular for automatic switching of lighting devices in vehicles, according to the definition of the species of Claim 1.

Such a sensor unit is known from German Patent 195 23 262.3, which includes a global sensor and a directional sensor for detecting the lighting conditions outside the vehicle. The sensor unit is connected to the analyzer unit which determines from the signals of the sensor unit whether a change in the circuit state of the lighting device is necessary under the given lighting conditions prevailing in the surroundings of the vehicle. Although this known sensor unit permits automatic switching of the lighting device, it includes a relatively large number of parts due to the global sensors and the directional sensors, and this means a high cost and expensive adjustment.

Advantages of the Invention

The device according to the present invention having the features of Claim 1 has the advantage that a simple, compact, robust, easy-to-assemble and practically adjustment-free sensor unit is available due to the integration of the global and directional sensors. Furthermore, the device includes only a minimal number of components, which permits simple and inexpensive production with expanded functionality. The small dimensions which are possible due to the integration of the global and directional sensors have proven to be another major advantage, because the size of components on the windshields of motor vehicles which interfere with vision should be minimized.

Advantageous refinements of the sensor unit according to the main claim are possible through the features characterized in the subclaims.

Due to the fact that at least three sensors detect light from predetermined directions, a wider range in front of the vehicle is detected. If at least one sensor is arranged in the direction of travel and the two other sensors are arranged, pivoted out of the direction of travel by an angle α on both sides, this yields a wide cone of detection in front of the vehicle, so that even the entrance of a tunnel which is not yet in the direction of travel can be detected and the lighting devices controlled accordingly.

If the directional sensors have lens-like elements, which may also have a smooth transition between them, the detection cone may be adjusted individually to the wishes of the automobile manufacturer.

Integration of the light guide body of the sensor unit into a light guide body of a rain sensor device makes it possible to eliminate additional components and to further reduce the number of components on the windshield which interfere with vision, in particular when the light guide body is manufactured in a multicomponent injection molding process together with the light guide body of the rain sensor and the coupling medium.

Brief Description of the Drawing

An embodiment of the present invention is illustrated in Figs. 1 and 2 and explained in greater detail in the following description. Fig. 1 shows a section through a sensor unit according to the present invention, and Fig. 2 shows a diagram of the sensor unit integrated into a light guide body of a rain sensor in a perspective view.

Detailed Description of the Embodiment

Fig. 1 shows a sensor unit 10 according to the present invention, mounted on a

windshield 11, in particular a windshield of a motor vehicle. Sensor unit 10 is composed of multiple sensors 12, each sensor 12 including a sensor element 13 and a light guide element 14, 14a. However, two light guide elements 14 here together use one sensor element 13, so that there are three light-sensitive sensor elements 13 having four light guide elements 14 and 14a. The light guide body on which light guide elements 14, 14a are mounted is composed of an at least partially transparent plate having cylindrical recesses sealed with lens-shaped round bodies. These cylindrical recesses together with the lens-shaped round bodies form a light guide element 14, 14a. If parallel light passes through the lens-shaped round bodies along the center axis of the cylindrical recesses, it yields a focal point f which characterizes a focal distance of light guide element 14, 14a.

Sensor elements 13 are each arranged between focal points f of light guide elements 14 and light guide elements 14 themselves. This yields a light detection cone directed forward in the direction of travel, allowing detection in predetermined directions. The cone angle of the light detection cone can be adjusted through the distance between focal points f of respective light guide element 14 and light-sensitive sensor elements 13.

An analyzer unit 15 controls the switching of a lighting device 16 as a function of the signals of sensor elements 13. Sensor elements 13 may be mounted jointly to a circuit board 17 and are preferably designed to permit a differentiation between daylight and artificial light to prevent a shutdown due to artificial lighting in a tunnel, for example. This can be accomplished through a suitable choice of the sensitivity range of sensor elements 13. It is also possible to select the sensitivity range so that certain spectral ranges or characteristic lines, e.g., of gas discharge lamps, are detected, thus permitting control of the high and low beams in a motor vehicle.

In addition to these directional sensors, at least one light guide element 14a is aimed forward but not necessarily in the direction of travel. The light detection cone of this minimum of one light guide element 14a has a very large cone angle and detects

global lighting conditions outside the vehicle.

5 All light guide elements 14, 14a, in particular the sensors of the global sensors and directional sensors, are combined in one piece in a light guide body 18. This light guide body 18 may be manufactured as an injection molded part of transparent or UV-permeable plastic. It is likewise possible to manufacture light guide body 18 of a pigmented or coated plastic which includes an optionally desired filter effect for influencing the sensitivity range of the sensor. This light guide body is pressed onto the windshield over a coupling medium 19, e.g., a silicone pad. Coupling medium 19 prevents air inclusions between windshield 11 and light guide body which would cause unwanted scattering. It is also possible to apply coupling medium 19 directly to light guide body 18 in the manufacture thereof in a multicomponent injection molding process.

What is claimed is:

1. A light-sensitive sensor unit (10), in particular for automatic switching of lighting devices, preferably in motor vehicles, including at least two light-sensitive sensors (12) which are provided with light guide elements (14, 14a) having a predeterminable reception characteristic, at least one first sensor (12) detecting the global lighting conditions, and at least one second sensor (12) detecting the lighting conditions in predetermined directions, wherein the light guide elements (14, 14a) provided for the sensors (12) are joined in one piece to form a light guide body (18).
2. The sensor unit according to Claim 1, wherein at least three sensors (12) detect light from predetermined directions.
3. The sensor unit according to one of Claims 1 or 2, wherein at least one sensor (12) is aligned with a predetermined direction in the direction of travel of a vehicle.
4. The sensor unit according to one of Claims 1 through 3, wherein at least one sensor (12) which detects the lighting conditions in a predetermined direction forms an angle α with a straight line in the direction of travel of a vehicle.
5. The sensor device according to Claim 4, wherein two sensors (12) on each side each enclose an angle α with a straight line pointing in the direction of travel and have a common light-sensitive sensor element (13).
6. The sensor device according to one of Claims 1 through 5, wherein there is a smooth transition between the light guide elements (14, 14a).

7. The sensor device according to one of the preceding claims,
wherein the light detection cones of the light guide elements (14, 14a) overlap.

8. The sensor device according to one of the preceding claims,
wherein the sensor elements (13) are designed as sensor elements (13) which
distinguish between daylight and artificial light.

9. The sensor device according to one of the preceding claims,
wherein the analyzer unit (15) is designed as an analyzer unit (15) which
distinguishes between daylight and artificial light.

10. The sensor device according to one of the preceding claims,
wherein the light guide body (17) is integrated into a light guide body of a rain sensor
device.

11. The sensor device according to Claim 8,
wherein the light guide body (17) is manufactured in a multicomponent injection
molding process, in particular together with the light guide body of the rain sensor
and a coupling medium.

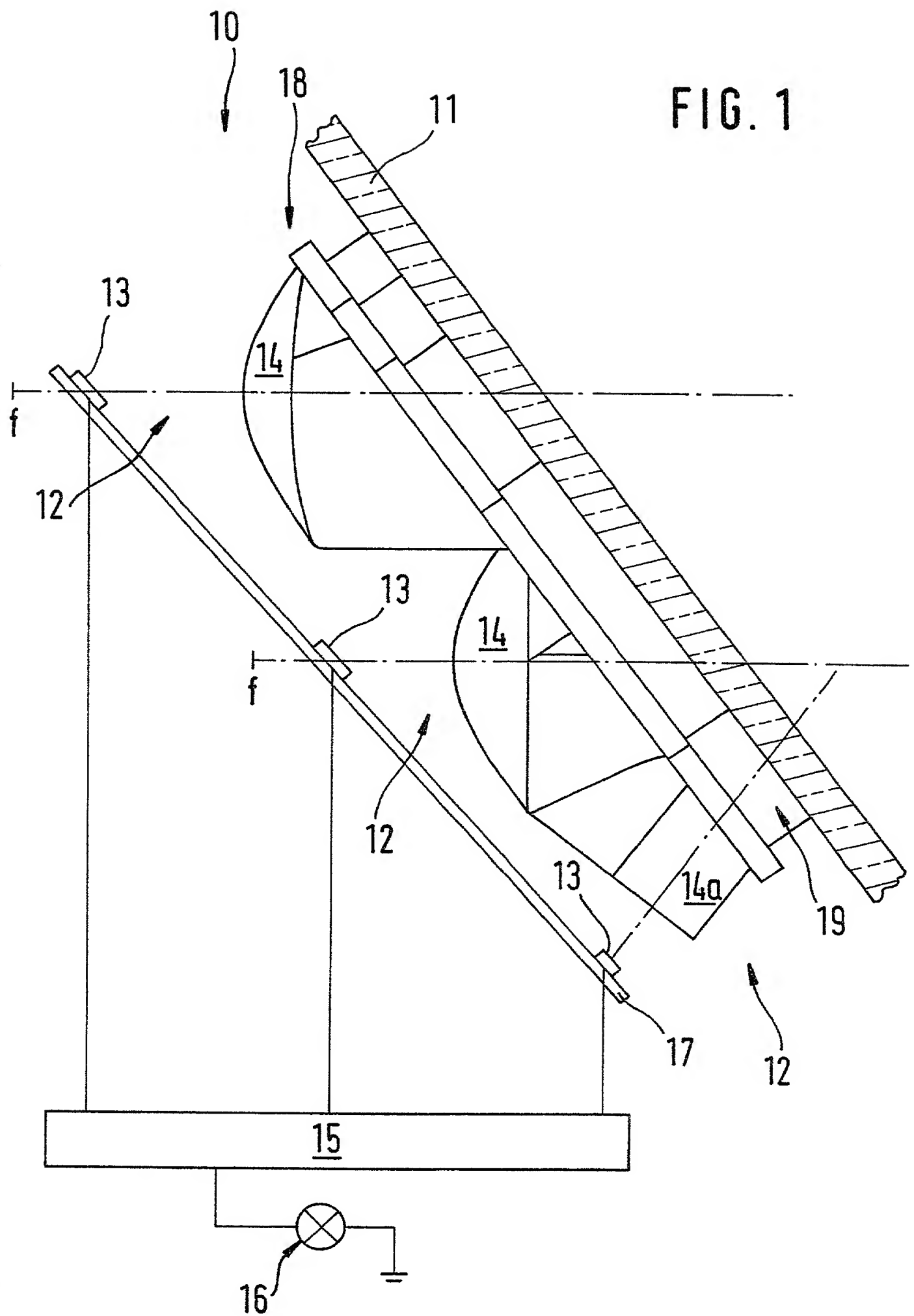
Abstract of the Disclosure

A light-sensitive sensor unit, in particular for automatic switching of lighting devices, preferably in motor vehicles, including at least two light-sensitive sensors, at least
5 one first sensor detecting the global lighting conditions, and at least one second sensor detecting the lighting conditions in predetermined directions. All light guide elements provided for the sensors are joined in one piece to form a light guide body.

(Fig. 1)

439668

FIG. 1



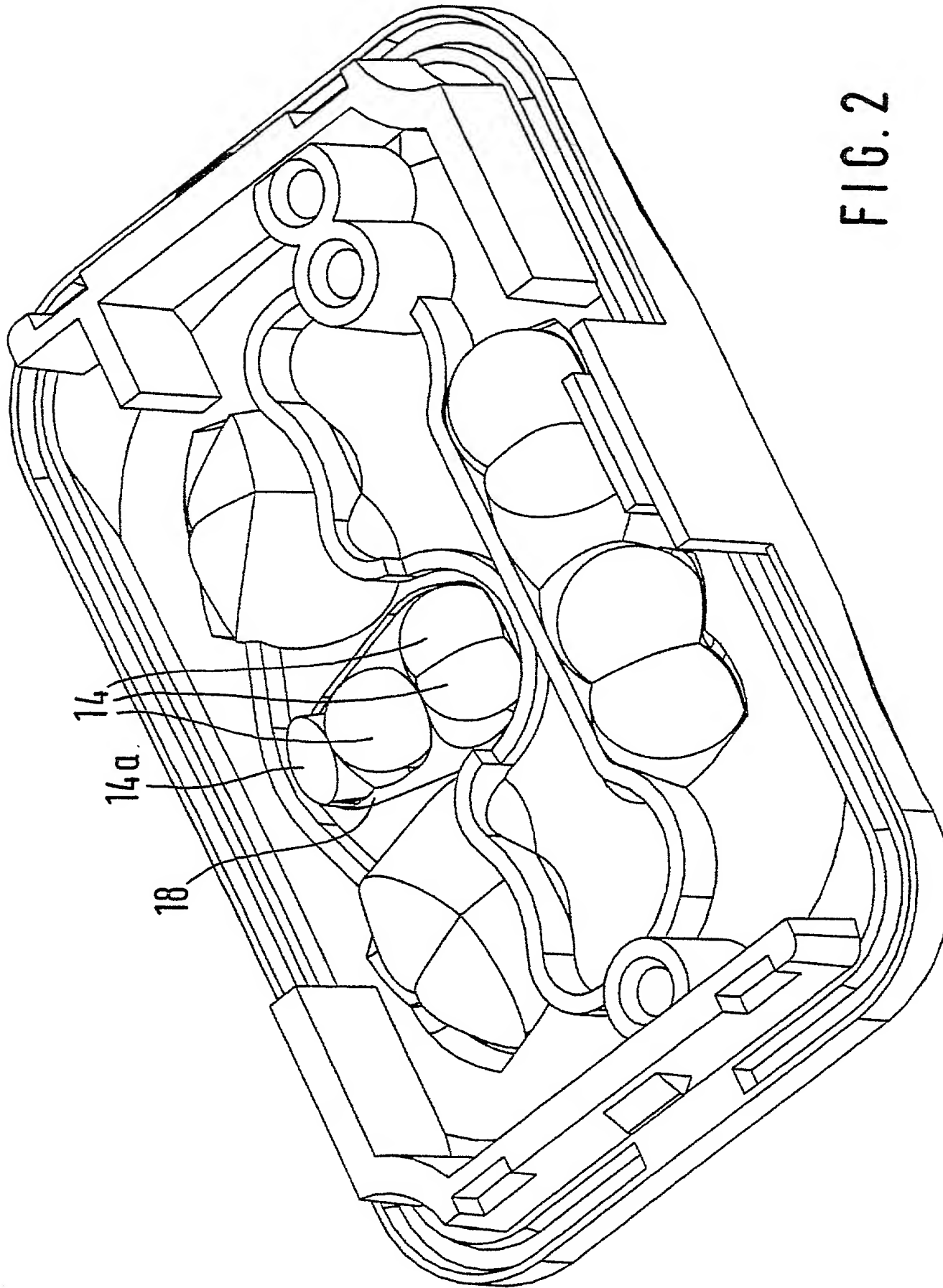


FIG. 2



DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR FOR AUTOMATIC SWITCHING OF LIGHTING DEVICES**, the specification of which was filed as International Application No. PCT/DE00/01989 on June 15, 2000.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

Number	Country Filed	Day/Month/Year	Priority Claimed Under 35 USC 119
199 33 642.3	Fed. Rep. of Germany	July 17, 1999	Yes

~~8224450440~~

And I hereby appoint Richard L. Mayer (Reg. No. 22,490) and Gerard A. Messina (Reg. No. 35,952) my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all communications regarding this application to:



KENYON & KENYON
One Broadway
New York, New York 10004

Please direct all telephone calls to Richard L. Mayer at (212) 425-7200.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor: Norbert HOG

100
Inventor's Signature: Norbert HOG

Date: 06 Feb 02

Residence: Im Wasserbett 12
77815 Buehl DEU
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

Inventor: **Bruno HODAPP**

200
Inventor's Signature: Bruno H. Hodapp

Date: 07.02.2002

Residence: Katzenfeld 7
77855 Achern-Oensbach DE
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

380
Inventor:

Rainer PIENTKA

Inventor's Signature:

Rainer Pientka

Date: 2002-02-07

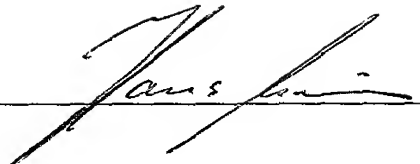
Residence:

Krokusweg 12
77871 Renchen ^{DEV}
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

480 Inventor: Hans MEIER

Inventor's Signature: 

Date: 07.02.2002

Residence: Mooslandstr. 49
77833 Ottersweier DEU
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

300 Inventor:

Henry BLITZKE

Inventor's Signature:

Henry Blitzke

Date: 07.02.2002

Residence:

Forlenstr. 3

77815 Buehl

Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

100 Inventor: Manfred BURKART

Inventor's Signature: M. Burkart

Date: 08.02.02

Residence: Benazetstr. 6
76473 Iffezheim ^{DEK}
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.